GRAPH IMAGING OF QUANTUM DETECTIONS

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We present a generalized and exhaustive method of finding the directions of the quantization axes of the measured eigenstates within experiments which have no classical counterparts. The method relies on a constructive and exhaustive definition of sets of such directions (which we call Kochen-Specker vectors) in a Hilbert space of any dimension as well as of all the remaining vectors of the space. Kochen-Specker vectors are elements of any set of orthonormal states, i.e., vectors in n-dim Hilbert space, $n > 2$ to which it is impossible to assign 1s and 0s in such a way that no two mutually orthogonal vectors from the set are both assigned 1 and that not all mutually orthogonal vectors are assigned 0. Our constructive definition of such Kochen-Specker vectors is based on imaging of nonlinear equations that define the geometry of the vectors to linear graphs, the so-called MMP diagrams. Thus we substitute solving nonlinear equations by checking conditions imposed on the corresponding graphs. In doing so we reduce the exponentially complex task of solving nonlinear equations to a polynomial complex task of generating and sorting the graph images of the equations.
The latter procedure invokes a 2-dimensional meta-imaging - a representation of graphs as figures on which we can define states and find final solutions by rejecting all those ones that allow them. The algorithms are limited neither by the number of dimensions nor by the number of vectors and can also be used as a general method for solving particular nonlinear equations in any other imaginable application. We obtained thousands of new Kochen-Specker vectors in practically no time. While solving systems of nonlinear equations by brute force would take ages and ages of the Universe, generation and elimination of graphs take minutes and hours.

Reference:

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